

CLAIMS

1. A switching power supply circuit, comprising:
 - switching means including a switching element for receiving a DC input voltage as an input thereto to perform switching operation;
 - switching driving means for switching driving said switching element;
 - a converter transformer formed by winding thereon at least a primary winding to which a switching output obtained by the switching operation of said switching means is supplied and a plurality of secondary windings in each of which an alternating voltage as the switching output obtained in said primary winding is excited;
 - first DC output voltage production means for receiving the alternating voltage obtained in one of said plural secondary windings of said converter transformer as an input thereto to perform rectification operation to produce a first DC output voltage;
 - second DC output voltage production means for receiving the alternating voltage obtained in a different one of said plural secondary windings as an input thereto to perform rectification operation to produce a second DC output voltage, said second DC output voltage production means supplying a load thereto with power lower than that

supplied by said first DC output voltage production means;

frequency controlled type constant voltage controlling means for controlling said switching driving means in response to the level of a first secondary side DC output voltage produced by said first DC output voltage production means to adjust the switching frequency of said switching means to perform constant voltage control for the first DC output voltage; and

inductance controlled type constant voltage controlling means including a control transformer as a saturable reactor having a controlling winding and a controlled winding wound thereon, said controlled winding being inserted between the different secondary winding and said secondary DC output voltage production means, said inductance controlled type constant voltage controlling means adjusting the level of control current to be supplied to said controlling winding in response to the level of the second DC output voltage from said second DC output voltage production means to adjust the inductance of said controlled winding to perform constant voltage control for the second DC output voltage.

2. The switching power supply circuit according to claim 1, wherein said converter transformer is a

transformer which includes a core having a central magnetic leg and has a gap provided on said central magnetic leg and wherein said primary winding and said plural secondary windings are wound on said central magnetic leg such that said transformer has a coupling coefficient which represents rough coupling.

3. The switching power supply circuit according to claim 2, wherein said switching means is a switching means including two switching elements connected between the DC input voltage and a reference potential and connected in cascade connection to each other through a nodal point, and

said switching power supply circuit further comprises a series resonance circuit formed from a leakage inductance component of said primary winding of said converter transformer and a capacitance of a primary side series resonance capacitor connected in series to said primary winding and connected between the nodal point of the two switching elements and the reference potential, said series resonance circuit causing the switching output obtained by said switching means to resonate.

4. The switching power supply circuit according to claim 3, further comprising a partial resonance circuit

including a parallel resonance capacitor connected in parallel to one of said two switching elements which is connected to the reference potential for performing partial resonance operation together with the leakage inductance component of said primary winding of said converter transformer.

5. The switching power supply circuit according to claim 3, wherein each of said plural secondary windings is divided into two divisional winding portions by a center tap connected to the reference potential such that alternating voltages whose periods of time within which the alternating voltages have the positive polarity or the negative polarity are different from each other are induced in the divisional winding portions, and

each of said first and second DC output voltage production means is a full wave rectification and smoothing circuit which includes two rectifiers individually connected at one end portions thereof to the two divisional winding portions divided by the center tap and connected at the other end thereof commonly for rectifying the induced alternating voltages and a smoothing capacitor connected between the other ends of the two rectifiers and the reference potential.

6. The switching power supply circuit according to

claim 5, further comprising a resistor connected between the two divided winding portions of each of said plural secondary windings.

7. The switching power supply circuit according to claim 1, wherein said inductance controlled type constant voltage controlling means includes:

a shunt regulator for producing an output of a level corresponding to an error of the level of the second DC output voltage; and

an amplification circuit connected, while the first DC output voltage is supplied to one end of said controlling winding as power supply, to the other end of said controlling winding for amplifying and outputting the output of said shunt regulator as control current to said controlling winding.

8. The switching power supply circuit according to claim 7, wherein said inductance controlled type constant voltage controlling means stops the supply of power to said amplification circuit in response to occurrence of load short-circuiting with regard to the second DC output voltage, and said switching power supply circuit further comprises a switch circuit including a required number of transistor elements.

9. The switching power supply circuit according to

claim 5, wherein said control transformer is an orthogonal controlled type transformer which includes a pair of controlled windings whose inductance is adjusted in response to adjustment of the level of the control current to be supplied to said controlling winding and on which said controlling winding is disposed so as to be orthogonal to the pair of controlled windings.

10. The switching power supply circuit according to claim 5, further comprising:

a full wave rectification and smoothing circuit provided in parallel to said first DC output voltage production means and including two rectifiers individually connected at one end portions thereof to the two divisional winding portions for rectifying the induced alternating voltages and a smoothing capacitor connected between the other ends of the two rectifiers connected commonly and the reference potential for supplying a third DC output voltage;

a control transformer including a pair of controlled windings and a pair of controlling windings individually connected in series between the two divisional winding portions and the two rectifiers; and

second inductance controlled type constant voltage control means for adjusting the level of the control

current to be supplied to said controlling winding in response to the level of the third DC output voltage from said full wave rectification and smoothing circuit to adjust the inductance of said controlled winding to perform constant voltage control for the third DC output voltage.